

**NORTH CAROLINA DIVISION OF
AIR QUALITY**

Application Review

Issue Date:

Region: Mooresville Regional Office
County: Iredell
NC Facility ID: 4900261
Inspector's Name: Joseph Foutz
Date of Last Inspection: 04/13/2016
Compliance Code: 3 / Compliance - inspection

Facility Data Applicant (Facility's Name): Cardinal FG Company Facility Address: Cardinal FG Company 342 Mooresville Boulevard Mooresville, NC 28115 SIC: 3211 / Flat Glass NAICS: 327211 / Flat Glass Manufacturing Facility Classification: Before: Title V After: Title V Fee Classification: Before: Title V After: Title V				Permit Applicability (this application only) SIP: 02D .0501(e), 02D .0515, 02D .0516, 02D .0521, 02D .0524, 02D .0530, 02D .1100, 02D .1111, 02Q .0317, 02Q .0614, 02Q .0711 NSPS: NSPS CC, NSPS III NESHAP: MACT ZZZZ PSD: YES PSD Avoidance: YES NC Toxics: YES 112(r): NO Other: TV Permit Renewal			
Contact Data				Application Data			
Facility Contact Jamie Smith Engineer (704) 660-0900 342 Mooresville Boulevard Mooresville, NC 28115	Authorized Contact James Stevens Plant Manager (704) 660-0900 342 Mooresville Boulevard Mooresville, NC 28115	Technical Contact Steven Klafka Environmental Engineer (608) 255-5030 303 South Paterson Street Madison, WI 53703	Application Number: 4900261.16B Date Received: 12/16/2016 Application Type: Renewal Application Schedule: TV-Renewal Existing Permit Data Existing Permit Number: 08618/T06 Existing Permit Issue Date: 03/31/2016 Existing Permit Expiration Date: 09/30/2017				
Total Actual emissions in TONS/YEAR:							
CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2015	160.11	565.81	21.55	193.80	13.25	0.9290	0.8800 [Hexane, n-]
2014	178.66	699.10	42.31	71.86	58.62	1.35	1.29 [Hexane, n-]
2013	121.48	730.74	40.58	67.58	72.34	1.30	1.23 [Hexane, n-]
2012	213.00	776.69	42.05	83.78	51.28	1.27	1.21 [Hexane, n-]
2011	200.44	746.11	42.48	80.51	49.31	1.22	1.16 [Hexane, n-]
Review Engineer: Betty Gatano Review Engineer's Signature: _____ Date: _____					Comments / Recommendations: Issue 08618/T07 Permit Issue Date: _____ Permit Expiration Date: _____		

1. Purpose of Application

Cardinal Fg Flat Glass Plant (Cardinal) currently holds Title V Permit No. 08618T06 with an expiration date of September 30, 2017 for a flat glass manufacturing facility in Mooresville, Iredell County, North Carolina. This permit application is for a permit renewal. The renewal application was received on December 16, 2016, or at least nine months prior to the expiration date, as required by General Permit Condition 3.K. Therefore, the existing permit shall not expire until the renewal permit has been issued or denied. All terms and conditions of the existing permit shall remain in effect until the renewal permit has been issued or denied.

The facility has requested to add a 1,000 kW diesel-fired emergency generator (ID No. IP09) and associated fuel oil tank (ID No. IP10) under this permit renewal. Both these emission sources are insignificant activities.

The facility is referred to as “Cardinal Fg Flat Glass Plant” in the current permit, Air Permit No. 08618T06. However, Form AA of the permit renewal application lists the site name as “Cardinal FG Company.” This same name is registered with the NC Secretary of State. For these reasons, the name of the facility will be changed to Cardinal FG Company under this permit renewal.

2. Facility Description

Cardinal manufactures flat glass at its facility by first introducing raw material (silica sand, soda ash, limestone, etc.) into the furnace (ID No. P01) at the “melting.” The heat from the furnace melts the raw material to form glass. The glass then flows toward the refiner, which allows the glass to gas off bubbles that occur during the melting process. The glass then flows to the tin bath where it is formed into the width and thickness desired. After the tin bath the glass flows to the annealing lehr (ID No. P07), where sulfur dioxide (SO₂) is injected on the rollers and surface of the glass to prevent staining. The majority of the SO₂ is retained by the glass, and unused SO₂ is released inside the building as fugitive emissions. From the lehr, the glass is then cooled for cutting and packing.

Emissions of nitrogen oxides (NO_x) from the glass melting furnace (including refiner) are controlled by 3R Process (reaction and reduction in the regenerators). Under the current air permit, Cardinal was permitted to install and operate a new control system on the furnace. This control system, called the Tri-Mer system, will consist of dry sorbent injection for SO₂ control (ID No. C01A), ammonia injection for NO_x control (ID No. C01B) and catalytic ceramic filters for particulate matter (PM) control (ID No. C01C). Please see the permit review for Air Permit No. 08618T06 for a complete description of the control system.¹ These control devices are not required for compliance with any air quality regulations, at this time. Operation of these control systems is expected to begin in March/April 2017.

Cardinal operates 4 work groups that alternate 12 hour shifts. The facility operates 24 hours per day, 365 days per year.

¹ Joseph Voelker (03/31/2016).

3. History/Background/Application Chronology

Permit History since Previous Permit Renewal

October 17, 2012	TV permit renewal issued. Air Permit No. 08618T05 was issued on October 17, 2012 with a permit expiration date of September 30, 2017.
March 31, 2016	Air Permit No. 08648T06 was issued as a minor modification. The facility added a new control system (ID Nos. CD01A, CD01B, and CD01C) on the glass furnace (ID No. P01). The facility also requested to reduce the emissions to below the Prevention of Significant Deterioration (PSD) thresholds of 250 tons per year. Upon review, the DAQ determined the facility could not change its major source status to minor under PSD by adding controls and taking enforceable limitations to stay below major source thresholds, as part of minor modification. The facility has not yet submitted any other permit application making this request.

Application Chronology

December 16, 2016	Received application for permit renewal.
December 21, 2016	Sent acknowledgment letter indicating that the application for permit renewal was complete.
December 21, 2016	Received comments from the Mooresville Regional Office (MRO).
January 12, 2017	Betty Gatano requested additional information on the new emergency generator (ID No. IP09) from Jamie Smith, facility contact, via telephone conversation. Mr. Smith submitted a Form D-4 for insignificant activities and emission calculations for the new emergency generator (ID No. I09) on January 13, 2017.
January 31, 2017	Betty Gatano and Jamie Smith discussed difficulties with testing the annealing lehr (ID No. P07) via phone.
February 1, 2017	Forwarded draft review and permit for comments.
February 3, 2017	Comments received Lori Phillips, Acting Permitting Supervisor.
February 6, 2017	Jamie Smith had questions regarding the applicability of 15A NCAC 02D .0958 to Cardinal. Betty Gatano addressed these questions on February 7, 2017.
March 8, 2017	Jamie Smith indicated the facility had no additional comments on the drafts.
March 10, 2017	Draft permit and permit review sent to public notice.

4. Permit Modifications/Changes and TVEE Discussion

The following table describes the modifications to the current permit as part of the renewal process.

Pages	Section	Description of Changes
--	Cover and throughout permit	Updated all dates and permit revision numbers.
--	Insignificant Activities	<ul style="list-style-type: none"> Added one diesel-fired 1,000 kw emergency generator (ID No. IP09). Added one 10,000 gallon diesel fuel oil tank (ID No. IP10).
--	Table of Contents	Removed section 2.2 for Multiple Emissions Sources. With the removal of 15A NCAC 02D .0958 from the permit, no other regulations apply facility-wide, and this section was removed.
3	Section 1.0 Equipment List	<ul style="list-style-type: none"> Added labels specifying equipment as applicable to PSD and GACT as appropriate. Removed footnote stating control devices (ID Nos. C01A, C01B, and C01C) were listed as a minor modification per 15A NCAC 02Q .0515. Added footnote stating control devices (ID Nos. C01, C01B, and C01C) are not required for compliance.
4	2.1 A – Equipment List	Added footnote stating control devices (ID Nos. C01A, C01B, and C01C) are not required for compliance.
4 – 5	2.1 A – Regulations Table	<ul style="list-style-type: none"> Rearranged the regulations so they are listed numerically. Corrected the particulate matter emission limit under 15A NCAC 02D .0524.
5	2.1 A.1	Moved condition for 15A NCAC 02D .0501(e) to Section 2.1 A.1 and renumbered permit accordingly.
6	2.1 A.3.c	Updated monitoring under 15A NCAC 02D .0521 with the most current permitting language.
7	2.1 A.5.a	Moved the definition of furnace cleaning from the footnote into Section 2.1 A.5.a for clarity.
7	2.1 A.5.c	Moved testing requirement under NCGS 143-215.108 from the “Monitoring” requirements to the “Testing” requirements.
8	2.1 A.5.d, e., and f	Added/updated noncompliance statements.
9	2.1 A.7	Updated permit condition for 15A NCAC 02Q .0711 to most current permitting language.
9	2.1 A.8	Modified condition to specify compliance with Section 2.1 A.1 rather than the entire permit.
9	2.1 B – Equipment List	Reformatted and modified the equipment list to include control devices associated with each emission source.
10	2.1 B.1	Added condition 15A NCAC 02D .0515 to Section 2.1 B.1 and renumbered permit accordingly. The Permittee follows requirements under Section 2.1 B.3 for compliance with 15A NCAC 02D .0515.
10	2.1 B.2.c	Updated monitoring condition under 15A NCAC 02D .0521 with the most current permitting language.
11	2.1 B.3.d	Added noncompliance statement.
12	2.1 C.1.b	Updated testing condition with most current permit language.
12	2.1 C.1.c and d	Removed monitoring, reporting, and recordkeeping requirements. No monitoring, recordkeeping, or reporting is required when firing diesel fuel in the emergency engine because of the low sulfur content of the fuel.
12	2.1 C.2	Moved condition for 15A NCAC 02D .0521 to Section 2.1 C.2 and renumbered permit accordingly.

Pages	Section	Description of Changes
13 – 15	2.1 C.4	Updated condition for GACT Subpart ZZZZ with most current permitting language.
16	2.1 D.1.c and d.	<ul style="list-style-type: none"> Removed permit condition requiring testing within 180 days from issuance of Air Permit 08618T05, as this requirement has been met. Removed permit condition requiring testing every five years. Renumbered permit accordingly.
17	2.1 E – Regulations Table	Removed reference to 15A NCAC 02D .0958. The rule is no longer applicable state-wide, effective November 1, 2016
--	2.2 A	Removed Section 2.2 for Multiple Emission Sources for sources subject to 15A NCAC 02D .0958. The rule is no longer applicable state-wide, effective November 1, 2016

The following changes were made to the Title V Equipment Editor (TVEE) under this permit renewal.

- Added PSD and GACT Subpart ZZZZ labels as applicable to emission sources.
- Added a 1,000 kW diesel-fired emergency generator (ID No. IP09) and associated fuel oil tank (ID No. IP10) under this permit renewal. Both these emission sources are insignificant activities.

5. New Equipment

In the permit application, the facility proposes to install a 1,000 kW diesel-fired emergency generator (ID No. IP09) with an associated 10,000 gallon fuel tank (ID No. IP10). Discussion of the emissions and regulatory applicability of this equipment is provided in this section.

Diesel-Fired Emergency Generator (ID No. I09)

Emissions from the emergency generator were calculated using DAQ's "Large Diesel and Dual-fuel Engines Emissions Calculator LGD2012 Revision J" (06/22/2015). Emissions were calculated assuming 500 hours per year operation for an emergency generator and a sulfur content in the No. 2 fuel oil of 0.5 weight percent. Potential emissions from the generator are provided in the table below.

Pollutant	Potential Emissions (tpy)
PM/PM10/PM2.5	0.27
SO2	1.5
NOx	4.95
CO	2.1
VOC	0.27
Total HAPs	9.35 lb/yr
Largest HAP (benzene)	4.14 lb/yr
Notes: 1. Emissions for "controlled NOx" via ignition timing retard as specified in the DAQ's spreadsheet was used. This assumption was used because the engine must meet the NSPS Subpart IIII emission standards, which are much lower than the emission estimates in the spreadsheet. 2. Potential emissions assume operation at 500 hours per year.	

The emissions in the table differ slightly than values provided in the permit application. The emissions calculated from the DAQ spreadsheet were used for all pollutants because they represent a more conservative estimate. Even with the more conservative estimate, emissions are below the insignificant activity level in 15A NCAC 02Q .0503(8), and the emergency engine (ID No. I09) will be included on the list of insignificant activities.

Emissions of toxics air pollutants (TAPS) will increase slightly with the addition of the emergency generator. As required under 15A NCAC 02Q .0706, a facility-wide evaluation is required for any TAP having emission increases after modification and for any TAP that the facility was not emitting before modification.

A facility-wide evaluation was conducted for the TAPs emitted from the new emergency generator to ensure that no unacceptable risk to human health results from this modification. The highest annual actual emissions over the past five years as reported in the DAQ emission inventory were added to the potential emissions from the emergency engine for these TAPs. The results were then compared with the Toxic Air Pollutant Permitting Emissions Rates (TPERS) for each TAP. The table below shows the facility-wide estimated emissions of the TAPs and their respective TPERS. As shown below, emissions of arsenic and cadmium exceeded their TPER after modification, and emissions from these TAPs were investigated further.

TAPS	Facility-Wide Emissions			TPERS			Modeling Required
	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	
Acetaldehyde	2.75E-04	6.62E-03	1.37E-01	6.8			NO
Acrolein	8.40E-05	2.00E-03	4.20E-02	0.02			NO
Arsenic unlisted compounds	9.11E-04	2.18E-02	7.62			0.053	YES
Benzene	8.65E-03	2.08E-01	7.18			8.1	NO
Benzo(a)pyrene	2.70E-06	6.60E-05	1.37E-03			2.2	NO
Beryllium metal	3.20E-05	7.70E-04	1.60E-02			0.28	NO
Cadmium metal	6.02E-04	1.44E-02	5.01			0.37	YES
Soluble chromate compounds	4.49E-04	1.08E-02	3.67		0.013		NO
Formaldehyde	1.31E-02	3.13E-01	1.07E+02	0.04			NO
Manganese	1.22E-04	2.89E-03	5.41E-01		0.63		NO
Mercury vapor	7.17E-05	1.72E-03	3.64E-01		0.013		NO
Nickel metal	3.53E-04	8.47E-03	2.83		0.13		NO
Toluene	3.56E-03	8.54E-02	6.38	14.4	98		NO
Xylene	2.14E-03	5.00E-02	1.05	16.4	57		NO

Notes:

- Emissions from the emergency generator were calculated using DAQ's "Large Diesel and Dual-fuel Engines Emissions Calculator LGD2012 Revision J" (06/22/2015).
- Emissions of acrolein, benzo(a)pyrene, and beryllium have not been reported in the prior emission inventories for Cardinal.
- Actual emissions of arsenic, cadmium, and chromium were based on stack testing, and Cardinal uses the same emission rates for these pollutants each year.
- Highest actual emissions of acetaldehyde and xylene occurred in calendar year 2013, as reported in the DAQ emission inventory. These emissions were from the existing emergency engine (ID No. P06), and hourly emissions calculated assuming 500 hours of operation.

TAPS	Facility-Wide Emissions			TPERS			Modeling Required
	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	
<ul style="list-style-type: none">• Highest actual emissions of benzene, formaldehyde, and toluene occurred in calendar year 2014, as reported in the DAQ emission inventory. These emissions were primarily based on the furnace (ID No. P01), and hourly emissions calculated assuming 8760 hours of operation.• Highest actual emissions of nickel metal and mercury occurred in calendar year 2012, as reported in the DAQ emission inventory. These emissions were primarily based on the furnace (ID No. P01), and hourly emissions calculated assuming 8760 hours of operation.							

In the next step in the NC Air toxics evaluation, emissions of arsenic and cadmium were compared with previously modeled emissions to determine if this modification poses an unacceptable risk to human health. Total emissions of these TAPS (Facility-Wide Actual + Potential) are less than the modeled emission limits of arsenic and cadmium found in the permit. As shown in the following table, the emissions of these TAPs are a small percentage of the modeled limits, and thus, the addition of the emergency engine does not pose an unacceptable risk to human health.

TAPS	Total Emissions after modification (Facility-wide Actual + Potential) (lb/yr)	Emissions Limit for Glass Melt Furnace (lb/yr)	Percent of Emission Limit
Arsenic	7.62	367.9	2.1%
Cadmium	5.01	297.8	1.7%
Notes: Cardinal conducted modeling in 2003 in support of the increase in pull rate from 600 tph to 650 tph. The modeling was used to develop the emission limits specified in the permit for compliance with 15A NCAC 02 .1100.			

The new emergency generator is subject to the NESHAP Subpart ZZZZ “Stationary Reciprocating Internal Combustion Engines,” 40 CFR 63 Subpart ZZZZ (GACT 4Z) and the “New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines,” 40 CFR 60 Subpart IIII (NSPS Subpart IIII). A complete discussion of regulations applicable to the new emergency engine (ID No. I09) is provided below in Sections 6 and 7.

Diesel Storage Tank (ID No. I10)

Emissions from the new storage tank (ID No. I10) are negligible, and the tank is considered an insignificant activity per 15A NCAC 02Q .0503(8). This tank is not currently subject to any air quality regulations as discussed in this section.

- 15A NCAC 02D .0925, “Petroleum Liquid Storage in Fixed Roof Tanks” – This rule applies to fixed roof storage tanks with capacities greater than 39,000 gallons containing VOC liquids whose true vapor pressure is greater than 1.52 psi. The capacity of Tank I10 is smaller than the applicability criteria in the rule, and thus it is not subject to 02D .0925.
- 40 CFR 60 Subpart Kb, “Standards of Performance for Storage Vessels for Petroleum Liquids for which Construction, Reconstruction, or Modification Commenced after July 23, 1984” – This rule is applicable to storage vessels with a capacity greater than or equal to 75 m³ (~20,000 gallons) used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. The capacity of Tank I10 is smaller than the applicability criteria in the rule, and thus it is not subject to NSPS Subpart Kb.

6. Regulatory Review

Cardinal is subject to the following regulations. The permit will be updated to reflect the most current stipulations for all applicable regulations.

- 15A NCAC 02D .0501(e) – Compliance with National Ambient Air Quality Standards – Carbon monoxide (CO) emissions from the melt furnace (ID No. P01) shall not exceed 10 pounds per ton of glass produced, as per 02D .0501(e).

Cardinal originally accepted a PSD avoidance limit of 100 tpy of CO in its initial Title V and PSD permit on October 29, 1998. At the production rate of 600 tons per day of glass production, this limit was equivalent to approximately 0.9 lb/ton of CO. The facility requested a Pollution Control Project (PCP) exemption as allowed in the PSD at that time² because elevated temperatures required to meet the low CO limit were damaging process duct work. The CO limit under 02D .0501(e) was established through the PCP with the issuance of Air Permit No. 08618T03 on April 3, 2003. A detailed discussion of the background on this condition is provided in the permit review for the most recent TV permit renewal.³

The facility is required to test annually to demonstrate compliance with the CO limit. The results of the most recent testing for CO are provided in the table below:

Test Date	Test Results	Emission Limit	Compliance
April 13, 2016	1.91 lb/ton glass	10 lb/ton glass	Yes
June 10, 2015	2.22 lb/ton glass		Yes
April 10, 2013	0.62 lb/ton glass		Yes
April 21, 2010	0.74 lb/ton glass		Yes
<u>Notes:</u> The 2010 and 2013 testing resulted in a CO emission factors so low that based on the information presented in the review for Air Permit No. 08618T03 they could only be obtained by elevated temperatures in the downstream ductwork that resulted in damage. An explanation for the extremely low CO results was discussed in detail in the permit review for the most recent TV permit renewal (Joseph Voelker (10/17/2012)).			

No changes to the permit are required under this permit renewal, and continued compliance is anticipated.

- 15A NCAC 02D .0515, Particulates from Miscellaneous Industrial Processes – The cullet return (ID No. P02), the bottom of the elevators (ID No. P03), the top of the elevators (ID No. P04), and the batch mixers (ID No. P05) are subject to 02D .0515. The facility complies with 02D .0515 by complying with the Best Available Control Technology (BACT) limit for PM for these sources. However, the permit does not currently contain a condition for 02D .0515. A condition will be added under this permit renewal specifying that facility complies with 02D .0515 by meeting the monitoring, recordkeeping, and reporting (MRR) requirements for BACT for these sources. Continued compliance is anticipated.

² The PCP exemption was later vacated by the U.S. Court of Appeals for the D.C. Circuit (2005), and the EPA amended its PSD rules to eliminate this option, effective July 13, 2007.

³ Joseph Voelker (10/17/2012).

- 02D .0516 Sulfur Dioxide Control Requirement – Emission sources subject to this rule shall not emit more than 2.3 pounds of sulfur dioxide per million Btu input.

The glass furnace (ID No. P01) is subject to this rule. The facility complies with this limit by complying with the BACT limits for SO₂ from the glass furnace. No changes to the permit are needed for the glass furnace, and continued compliance is anticipated.

The diesel-fired emergency generator (ID No. P06) is also subject to 02D .0516. Cardinal currently complies with 02D .0516 by complying with the BACT requirements for the engine. However, MRR are NOT typically required when firing diesel fuel in combustion sources because of the low sulfur content of the fuel. Diesel fuel is inherently low enough in sulfur that continued compliance is expected. The permit will be updated under this renewal to specify no MRR is required for compliance with 02D .0516 for the diesel-fired generator. Continued compliance is anticipated.

- 15A NCAC 02D .0521, Control of Visible Emissions – The following equipment was manufactured after July 1, 1971 and must not have visible emissions of more than 20 percent opacity when averaged over a six-minute period, except as specified in 15A NCAC 02D .0521(d):
 - The glass furnace (ID No. P01) – The facility is required to make daily visible emission observations and conduct associated recordkeeping and reporting to demonstrate compliance with 02D .0521. A statement was added requiring the facility to establish “normal” emissions from the furnace within the first 30 days following beginning operation of control devices (ID No. C01A, C01B, and C01C). Even though these control devices are not used for compliance, they will affect the exhaust from the furnace, and re-establishing “normal” visible emissions is appropriate. Continued compliance is anticipated.
 - The cullet return (ID No. P02), the bottom of the elevators (ID No. P03), the top of the elevators (ID No. P04), and the batch mixers (ID No. P05) – The facility is required to make weekly visible emission observations and conduct associated recordkeeping and reporting to demonstrate compliance with 02D .0521. The permit condition was updated to reflect the current permitting language under this permit renewal. Continued compliance is anticipated.
 - The diesel-fired emergency generator (ID No. P06) – No MRR is required for compliance with 02D .0521 from firing diesel fuel in this source.
- 15A NCAC 02D .0524, New Source Performance Standards (NSPS) – Cardinal is subject to the following NSPS:
 - “Standards of Performance for Glass Manufacturing Plants,” 40 CFR 60 Subpart CC.
 - “Standards of Performance for Stationary Compression Ignition Internal Combustion Engines,” 40 CFR Part 60 Subpart IIII.
 See Section 7 for more discussion of the requirements under NSPS.
- 15A NCAC 02D .0530, Prevention of Significant Deterioration (PSD) – The glass furnace (ID No. P01), the cullet return (ID No. P02), the bottom of the elevators (ID No. P03), the top of the elevators (ID No. P04), the batch mixers (ID No. P05), the diesel-fired emergency generator (ID No. P06), and the annealinglehr (ID No. P07) are all subject to BACT. More discussion on PSD and BACT is provided in Section 7.

- 15A NCAC 02D .0614, Compliance Assurance Monitoring (CAM) – The glass furnace (ID No. P01) is subject to CAM but exempt from requirements. See section 7 for more discussion of CAM.
- 15A NCAC 02D .1100, Control of Toxic Air Pollutants – This rule is state enforceable only. The glass melting furnace is subject to 02D .1100 for numerous TAPs. See Section 8 for further discussion regarding air toxics.
- 15A NCAC 02D .1111, Maximum Achievable Control Technology (MACT) – The emergency engines (ID Nos. P06 and IP09) are subject to the “NESHAP for Stationary Reciprocating Internal Combustion Engines,” 40 CFR Part 63, Subpart ZZZZ. See Section 7 for more discussion of the requirements under General Available Control Technology (GACT).
- 15A NCAC 02Q .0317, Avoidance Conditions – The facility has accepted a condition for PSD avoidance for VOC from the glass cutting operation (ID No. P08). More discussion regarding the PSD avoidance condition is presented in Section 7.
- 15A NCAC 02Q .0711, Emission Rates Requiring a Permit – This rule is state enforceable only. The glass melting furnace is subject to 02Q .0711 for ammonia. See Section 8 for further discussion regarding air toxics.
- NCGS 143-215.108(c) – When the new control system consisting of dry sorbent injection for SO₂ control (ID No. C01A), ammonia injection for NO_x control (ID No. C01B), and catalytic ceramic filters for PM control (ID No. C01C) was added to the permit under Air Permit No. 08618T06, the facility did not intend to use the control systems to meet any applicable requirements. A condition was added to the permit under NCGS 143-215.108(c) requiring the facility to submit a permit application to modify any current applicable requirements prior to the installation of the control devices (ID Nos. C01A, C01B, and C01C), if compliance could not be met. The permit condition will be modified under this permit renewal to specify compliance with 2.1 A.1 rather than the entire permit.

On November 1, 2016, amendments to 15A NCAC 02D .0902 were finalized to narrow applicability of work practice standards for VOC in 15A NCAC 02D .0958 from statewide to the maintenance area for the 1997 8-hour ozone standard. This change is being made primarily because the abundance of biogenic VOC emissions in North Carolina results in ozone formation being limited by the amount of available NO_x emissions. Provisions of the Clean Air Act require VOC requirements previously implemented in an ozone nonattainment area prior to redesignation remain in place. However, facilities outside the maintenance area counties for the 1997 8-hour ozone standard would no longer be required to comply with the work practice standards in 15A NCAC 02D .0958. The maintenance area counties also include Coddle Creek Township and Davidson Township in Iredell County, as specified in 15A NCAC 02D .0902. Although Cardinal is in Iredell County, the facility is located just outside the Coddle Creek Township and is not subject to 15A NCAC 02D .0958. The permit condition for this regulation will be removed under this permit renewal.

7. NSPS, NESHAPS/MACT, NSR/PSD, 112(r), RACT, CAM

NSPS

The applicability of NSPS for Cardinal is discussed in this section.

NSPS Subpart CC

The “Standards of Performance for Glass Manufacturing Plants,” 40 CFR 60 Subpart CC (NSPS Subpart CC) rule applies to glass furnaces commencing construction after June 15, 1979 with a glass melting furnace designed to produce 5 tons or greater of glass per day. The glass furnace (ID No. P01) at Cardinal began operation in 1999 and is permitted to produce 650 tons per day. Thus, it is subject to NSPS Subpart CC.

The furnace at Cardinal was originally permitted as a “modified process,” which is defined under 40 CFR 60.291 as “*using any technique designed to minimize emissions without the use of add-on pollution controls.*”

As such, the furnace was originally subject to a 1 lb/ton of filterable PM emission limitation for modified processes and required monitoring via the use of a continuous opacity monitoring system (COMS). Although the facility had no PM controls at the time, the facility opted to subject itself to the more stringent PM standard for “non-modified processes,” which also allowed it to not be required to use COMS. This change was implemented in Air Permit No. 08618T03 issued April 3, 2003. The facility has to meet the limit for filterable PM₁₀ in Table CC-1 of NSPS Subpart CC, which is given as 0.225 g of PM/kg of glass produced or 0.45 lb PM/ton of glass produced. With the construction and operation of the catalytic ceramic filters (ID No. C01C), PM emissions will be controlled as required by NSPS Subpart CC.

The facility is required to conduct stack testing annually to demonstrate compliance with the PM limit. The facility also has to maintain the glass pull rate to ensure the production rate does not exceed 110 percent of the production rate maintained the most recent stack test. The most recent stack testing results are provided in the table below.

Pollutant	Test Results	Emission Limit	Standard	Compliance
Filterable PM	0.160 g/kg glass 0.319 lb/ton glass	0.225 g/kg glass 0.45 lb/ton glass	60 Subpart CC	Yes
Glass Pull Rate	646 ton/day	650 ton/day	Permitted Max.	---
Notes: Testing occurred on April 13, 2016 and source test report reviewed and approved in a memorandum from Brent Hall of the SSCB on June 15, 2016.				

No changes to the permit are required, and continued compliance is anticipated.

NSPS Subpart IIII

The new diesel-fired emergency generator (ID No. IP09) is subject to “Standards of Performance for Stationary Compression Ignition Internal Combustion Engines,” 40 CFR 60, Subpart IIII (NSPS Subpart IIII). This regulation applies to owners and operators that commence construction of their compression ignition internal combustion engines after July 11, 2005, where the engines were manufactured after July 1, 2006, per 40 CFR 60.4200(a)(2)(ii). To comply with the emission standards for this emergency engine, Cardinal must purchase an emergency generator for the model year 2009 and later, certified to meet the emission standards for the same model year and maximum engine power in 40 CFR 89.112. The facility is expected to be in compliance with NSPS Subpart IIII for this engine. A summary of the requirement under NSPS Subpart IIII is provided in Attachment 1 to this permit review for reference.

NESHAPS/MACT

Cardinal is minor for hazardous air pollutants (HAPs) and is applicable to GACTs as discussed in this section.

MACT Subpart ZZZZ

The two emergency engines (ID Nos. P06 and IP09) at Cardinal are subject to the “NESHAP for Stationary Reciprocating Internal Combustion Engines, 40 CFR Part 63,” GACT Subpart ZZZZ. Emergency generator (ID No. P06) is an existing engine, greater than 500 hp, located at an area source of HAPs. The requirements under GACT Subpart ZZZZ for this engine are summarized below:

- Install a non-resettable hour meter on the engine
- Change oil and filter every 500 hours of operation or annually
- Inspect all hoses and belts every 500 hours of operation or annually and replace if necessary
- Inspect air cleaner every 1,000 hours of operation or annually
- Operate no more than 100 hours for maintenance and readiness testing
- Recordkeeping and reporting requirements

The permit will be updated to reflect the most recent revision to GACT Subpart ZZZZ.

The new emergency engine (ID No. IP09) is considered a new source under GACT Subpart ZZZZ because it will be construction on or after June 12, 2006. Per 40 CFR 63.590(c)(1), a new engine located at an area source of HAPs complies with GACT Subpart ZZZZ by meeting the requirements for NSPS Subpart IIII.

MACT Subpart SSSSSS

The “National Emission Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources,” 40 CFR 63 Subpart SSSSSS, applies to certain glass manufacturing facilities at area sources of HAPS. Specifically, it is applicable only to glass manufacturing facilities that use a glass manufacturing metal HAP, as defined in 40 CFR 63.11459 as raw materials in a glass manufacturing batch formulation. Cardinal does not use any HAP metal intentionally as raw material in its glass production, and thus, is not subject to this GACT.

NSR/PSD

Cardinal is a major source under PSD. The facility has undergone two PSD analyses and has numerous BACT limits in its permits.

This facility was issued an initial Title V and PSD permit on October 29, 1998 for an allowed process capacity of 600 tons of flat glass per day. The pull rate was increased to 650 tons with the issuance of Air Permit No. 08618T03 on April 3, 2003. The production increase resulted from changes in the method of operation of the tin bath to remove a bottleneck in the production line. No air pollution emissions occur from the tin bath section of the glass making process. No physical changes to any of the process emission sources were required to accommodate this production increase. Because the debottlenecking was not on an emission source, PSD was not triggered at that time.

As discussed in a previous permit review,⁴ a Title V renewal application was received from Cardinal on December 31, 2002. The permit was modified slightly to reflect updated testing, monitoring, recordkeeping, and reporting language and was sent to public notice from February 7, 2003 to March 9, 2003. Blue Ridge Environmental Defense League [BREDL] submitted comments concerning the draft permit renewal on March 10, 2003. Their comments requested that Cardinal be subject to a new PSD review and determination based on their concerns expressed in a petition filed with EPA Region IV in 1998. The Title V draft renewal along with BREDL's comments were sent to EPA Region IV for review from April 8, 2003 through May 23, 2003. Based on discussions with EPA Region IV on the Title V draft renewal with public comments, DAQ agreed to perform a PSD review of triggered pollutants resulting from increased production rate permitted under Air Permit No. 08618T03.

The current BACT limits for Cardinal are provided in the following table. Other than testing for the annealing lehr as discussed below, no changes to the permit are required under this renewal, and continued compliance is anticipated.

Emission Source	Pollutants	BACT Limits
Permitted emission limits for the glass melting furnace (ID No. P01)	particulate matter	0.45 pounds per ton of glass produced (PM filterable)
		0.5 pounds per ton of glass produced (PM condensable)
		0.95 pounds total PM per ton of glass produced
		112.7 tons per year
	sulfur dioxide	<u>Normal production mode</u> 2.0 pounds per ton of glass produced
		<u>Furnace cleaning mode</u> 4.0 pounds per ton of glass produced
	nitrogen oxide	<u>Normal production mode</u> 7.0 pounds of NOx/ton of glass produced based on a 30 day rolling average
		<u>Furnace cleaning mode</u> 10.6 pounds of NOx/ton of glass produced based on a 30 day rolling average
Cullet Return (ID No. P02)	particulate matter (including PM-10)	0.0067 grains per actual cubic foot exhaust volume to atmosphere
Bottom of Three Elevators (ID No. P03)		
Top of Three Elevators (ID No. P04)		
Batch Mixers (ID No. P05)		
Diesel-Fired Emergency Generator (ID No. P06)	particulate matter (including PM-10)	diesel fuel usage limited to 2,964 gallons per 12-month period
	nitrogen oxide	
	sulfur dioxide	diesel fuel sulfur content limited to 0.05 percent by weight
Annealing Lehr (ID No. P07)	sulfur dioxide	process usage limited to 25 tons per 12-month period
		fugitive emissions limited to 0.75 pounds per hour

In addition to MRR requirements for all the emission sources above, Cardinal is also required to conduct periodic testing of the glass furnace (ID No. P01) and the annealing lehr (ID No. P07) to demonstrate compliance with the BACT emission limits. The glass furnace is tested annually, while testing on the lehr is conducted once per permit cycle.

⁴ Joseph Voelker (10/17/2012).

This testing requirement for the lehr was added under Air Permit No. 088618T05. Testing results for the lehr demonstrated compliance with the BACT limit as shown in the table below.

Test Date	Pollutant	Emission Rate	BACT Limit	Percent of Limit
05/22/2000	Fugitive SO ₂	0.69 lb/hr	0.75 lb/hr	92%
04/11/2013	Fugitive SO ₂	0.38 lb/hr	0.75 lb/hr	51%

As part of the current permit renewal, the facility has requested to remove the testing requirements for the annealing lehr. Specifically, Cardinal indicated testing is difficult due to the large size of the lehr (~15ft by 1000 ft) and fugitive release of emissions. The lehr could not be enclosed because of its size, and fugitive emissions occur along the length of the lehr. The MRO concurs with removing the testing requirement because the facility has demonstrated compliance with the BACT limit and because of the difficulty in testing. The testing requirement will be removed under this permit renewal.

Cardinal also has accepted a PSD avoidance condition for its glass cutting operation (ID No. P08). The lubricating fluid required by the cutting operation contains VOCs, and emissions of VOCs from this operation are limited to less than 40 tons per consecutive 12-month period. The avoidance condition was first added to the TV permit under Air Permit No. 08618T03 issued on April 3, 2003. No changes to the condition are required under this permit renewal and continued compliance is anticipated.

112(r)

The facility is not subject to Section 112(r) of the Clean Air Act requirements because it does not store any of the regulated substances in quantities above the thresholds. This permit renewal does not affect the 112(r) status of the facility.

CAM

40 CFR Part 64 is applicable to any pollutant-specific emission unit, if the following three conditions are met:

- the unit is subject to any (non-exempt: e.g. pre November 15, 1990, Section 111 or Section 112 standard) emission limitation or standard for the applicable regulated pollutant.
- the unit uses any control device to achieve compliance with any such emission limitation or standard.
- unit's precontrol potential emission rate exceeds either 100 tons/yr (for criteria pollutants) or 10/25 tons/yr (for HAPs).

A CAM analysis was conducted for this permit renewal, and the results are presented in the following table. As seen in the table, the furnace is subject to CAM only for NO_x emissions. Emissions of NO_x are currently controlled with the 3R Process, and these emissions are monitored using a Continuous Emission Monitoring System (CEMS) for compliance with the BACT limit. The facility is exempt from requirements under CAM for NO_x emissions from the furnace in accordance with 40 CFR 64.2(b)(vi), which states the following:

The requirements of this part shall not apply to any of the following emission limitations or standards:

...
(vi) *Emission limitations or standards for which a part 70 or 71 permit specifies a continuous compliance determination method, as defined in §64.1.*

The facility will continue to use the CEMS for monitoring NO_x when the catalytic ceramic filters (ID No. C01A) are installed in 2017. Thus, the exemption will remain upon installation of the new controls. Continued compliance is anticipated.

Emissions of SO₂ will be controlled when the dry reagent injection system (ID No. C01A) is installed on the furnace exhaust. However, the controls are not used for compliance at this time and thus, CAM is not applicable to SO₂ emissions from the furnace.

No other emission sources require CAM because precontrolled emissions are less than 100 tons per year, as shown in the table below.

Emission Source Description	Control Device Description	Pollutant	Regulation	Precontrolled Emissions (tpy)	Subject to CAM	Comments
Natural gas-fired glass melting furnace (ID No. P01)	“3R” process (ID No. CD01)	NOx	15A NCAC 02D .0530	1656	YES	Exempt from requirements per 40 CFR 64.2(b)(vi)
	Dry Sorbent Injection (ID No. C01A)	SO2	15A NCAC 02D .0501(e) 15A NCAC 02D .0516 15A NCAC 02D .0524 15A NCAC 02D .0530	215	NO	Controls are not required for compliance.
	Ammonia Injection (ID No. C01B)	NOx	15A NCAC 02D .0530	1656	YES	Exempt from requirements per 40 CFR 64.2(b)(vi)
	Catalytic Ceramic Filters (ID No. C01C)	PM	15A NCAC 02D .0524 15A NCAC 02D .0530	14	NO	Pre-controlled emissions less than 100 tpy.
Cullet Return (ID No. P02)	Bagfilter (ID No. C02)	PM	15A NCAC 02D .0515 15A NCAC 02D .0530	93	NO	Pre-controlled emissions less than 100 tpy.
Bottom of Elevator (ID No. P03)	Bagfilter (ID No. C03)	PM	15A NCAC 02D .0515 15A NCAC 02D .0530	9	NO	Pre-controlled emissions less than 100 tpy.
Top of Elevator (ID No. P04)	Bagfilter (ID No. C04)	PM	15A NCAC 02D .0515 15A NCAC 02D .0530	3	NO	Pre-controlled emissions less than 100 tpy.
Batch Mixers (ID No. P05)	Bagfilter (ID No. C05)	PM	15A NCAC 02D .0515 15A NCAC 02D .0530	--	NO	Pre-controlled emissions less than 100 tpy.

8. Facility Wide Air Toxics

Cardinal triggered a review under air toxics with its greenfield permit application, and modeled toxics limits were incorporated in the initial Title V permit. The modeled limits were revised under Air Permit No. 08618T03 when the glass pull rate was increased from 600 to 650 tons per hour. These limits remain in the permit. No MRR is required for compliance with NC Air Toxics, and no changes to the permit are required under this permit renewal.

Cardinal was permitted to add ammonia injection for NO_x control (ID No. C01B) on the glass furnace (ID No. P01) under Air Permit No. 08618T06. Ammonia emission rates are expected to be below its TPER, and a requirement for submitting a permit application if the ammonia emissions exceed its TPER was added to the permit at that time. This permit condition will be updated under this permit renewal to reflect the current permitting language. Continued compliance is anticipated.

9. Facility Emissions Review

There is no change in Title V potential emissions under this permit renewal. Actual emissions for 2011 and 2015 as reported in the emission inventories are presented in the header to this permit review.

10. Compliance Status

During the most recent inspection, conducted on April 13, 2016, by Joe Foutz of the MRO, the facility appeared to be in compliance with all applicable requirements. A signed Title V Compliance Certification (Form E5) indicating that the facility was in compliance with all applicable requirements was included with the permit renewal.

11. Public Notice/EPA and Affected State(s) Review

A notice of the DRAFT Title V Permit shall be made pursuant to 15A NCAC 02Q .0521. The notice will provide for a 30-day comment period, with an opportunity for a public hearing. Copies of the public notice shall be sent to persons on the Title V mailing list and EPA. Pursuant to 15A NCAC 02Q .0522, a copy of each permit application, each proposed permit and each final permit pursuant shall be provided to EPA. Also pursuant to 02Q .0522, a notice of the DRAFT Title V Permit shall be provided to each affected State at or before the time notice provided to the public under 02Q .0521 above. South Carolina and the local air quality programs for Forsyth and Mecklenburg counties are within 50 miles of this facility and will be notified accordingly.

12. Other Regulatory Considerations

- A P.E. seal is NOT required for this application.
- A zoning consistency determination is NOT required for this application.
- A permit fee is NOT required for this modification.

13. Recommendations

The permit renewal application for Cardinal FG Company located in Mooresville, Iredell County, NC has been reviewed by NC DAQ to determine compliance with all procedures and requirements. NC DAQ has determined that this facility is complying or will achieve compliance, as specified in the permit, with all requirements that are applicable to the affected sources. The NC DAQ recommends the issuance of Air Permit No. 08618T07.

Attachment 1

Summary of Requirements under NSPS Subpart IIII

Applicability [15A NCAC 02Q .0508(f), 40 CFR 60.4200(a)(2)(ii)]

For this emergency generator (ID No. IP09), the Permittee shall comply with all applicable provisions, including the requirements for emission standards, notification, testing, reporting, record keeping, and monitoring, contained in Environmental Management Commission Standard 15A NCAC 02D .0524 "New Source Performance Standards (NSPS)" as promulgated in 40 CFR Part 60 Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines," including Subpart A "General Provisions."

General Provisions

Pursuant to 40 CFR 60 .4218, the Permittee shall comply with the General Provisions of 40 CFR 60 Subpart A as presented in Table 8 of 40 CFR 60 Subpart IIII.

Emission Standards [40CFR 60.4205(c)]

The Permittee shall comply with the emission standards in Table 4 of NSPS subpart IIII for all pollutants, for the same model year and maximum engine power for this engine.

Fuel Requirements [40 CFR 60.4207(b) and 40 CFR 80.510(b)]

The Permittee shall use diesel fuel in the engine with:

- A maximum sulfur content of 15 ppm; and
- A minimum cetane index of 40 or a maximum aromatic content of 35 volume percent.

Monitoring [[40CFR 60.4209(a) and 40CFR 60.4209(b)]]

The engine has the following monitoring requirements:

- The engine shall be equipped with a non-resettable hour meter prior to startup.
- The engine, if equipped with a diesel particulate filter, must be installed with a backpressure monitor that notifies the owner or operator when the high backpressure limit of the engine is approached.

Compliance Requirements

- The Permittee shall [40CFR 60.4206 and 60.4211(a)]:
 - Operate and maintain the engines and control devices according to the manufacturer's emission related-written instructions over the entire life of the engine;
 - Change only those emission-related settings that are permitted by the manufacturer; and
 - Meet the requirements of 40 CFR 89, 94 and/or 1068 as applicable.
- The Permittee shall comply with the emission standards by purchasing an engine certified to the emission standards in Table 4 of NSPS subpart IIII for all pollutants, for the same model year and maximum engine power for this engine. The engine shall be installed and configured according to the manufacturer's emission-related specifications. [40CFR 60.4211(c)]
- In order for the engine to be considered an emergency stationary internal combustion engine (ICE), any operation other than emergency operation, maintenance and testing, emergency demand response, and operation in non-emergency situations for 50 hours per year, as described below, is prohibited. [40CFR 60.4211(f)]
 - There is no time limit on the use of emergency stationary ICE in emergency situations.
 - The Permittee may operate the emergency stationary ICE for any combination of the purposes specified in 40 CFR 60.4211(f)(2)(i-iii) for a maximum of 100 hours per calendar year. Any operation for non-emergency situations as allowed by 40 CFR 60.4211(f)(3) counts as part of the 100 hours per calendar year.
 - The emergency stationary ICE may be operated for up to 50 hours per calendar year in non-emergency situations. The 50 hours of operation in non-emergency situations are counted as part of the 100 hours per calendar year for maintenance and testing and emergency demand response provided in 40 CFR 60.4211(f)(2). Except as provided in 40 CFR 60.4211(f)(3)(i), the 50 hours per calendar year for non-emergency situations cannot be used for peak shaving or non-emergency demand response, or to generate income for a facility to an electric grid or otherwise supply power as part of a financial arrangement with another entity.

- If the Permittee does not install, configure, operate, and maintain the engine and control device according to the manufacturer's emission-related written instructions, or the Permittee changes change emission-related settings in a way that is not permitted by the manufacturer, the Permittee must [40CFR 60.4211(g)]:
- Keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions.
- Conduct an initial performance test to demonstrate compliance with the applicable emission standards within 1 year of startup, or within 1 year after an engine and control device is no longer installed, configured, operated, and maintained in accordance with the manufacturer's emission-related written instructions, or within 1 year after the change in emission-related settings that is not permitted by the manufacturer

Recordkeeping

To assure compliance, the Permittee shall perform inspections and maintenance on the engine as recommended by the manufacturer per 40 CFR 60.4206 and 40 CFR 60.4211(a). If a PM filter is used, records of any corrective action taken after the backpressure monitor has notified the owner or operator that the high backpressure limit of the engine is approached [40 CFR60.4214(c)]. The Permittee shall maintain documentation from the manufacturer that the engine is certified to meet the emission standards in Table 4 of NSPS subpart IIII for all pollutants, for the same model year and maximum engine power for this engine.

Reporting

If the Permittee owns or operates an emergency stationary CI ICE with a maximum engine power more than 100 HP that operates or is contractually obligated to be available for more than 15 hours per calendar year for the purposes specified in conditions (i)(2)(ii) and (iii) or that operates for the purposes specified in condition(i)(3)(i), the Permittee shall submit an annual report according to the requirements at 40 CFR 60.4214(d).